QUIZ#6- CHAPTER 7
DATE: 06/11/17

Name: Key Id#: Sect.#:

A 1500 kg car accelerates uniformly from rest to 108 km/h in 20 sec.
(a) What is the power delivered by the car's engine at t = 20 sec?

$$v = 108 \frac{km}{h}\left(\frac{1000}{3600}\right) = 30\ m/s$$

$$v = at + \cancel{v_0}^{0} \Rightarrow a = \frac{v}{t} = \frac{30}{20} = 1.5\ m/s^2$$

$$P_{inst.} = F v = m a v$$

$$= 1500 \times 1.5 \times 30 = \boxed{67{,}500\ W}$$

(b) What is the average power delivered by the car's engine in the time interval t = 0 sec to t = 20 sec?

$$P_{avg} = \frac{W}{\Delta t} = \frac{\Delta K}{\Delta t} = \frac{K_f - \cancel{K_i}^{0}}{\Delta t}$$

$$= \frac{\frac{1}{2} m v_f^2}{\Delta t} = \frac{0.5 \times (30)^2 \times 1500}{20}$$

$$= \boxed{33{,}750\ W}$$

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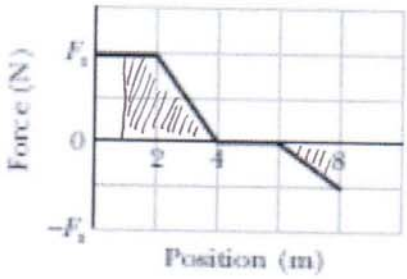
A 5.0 kg object moving along the x-axis has a velocity of 8.0 m/s at x = 1.0 m. If the only force acting on this object is shown in the figure, what is the speed of the object at x = 8.0 m? Take F_s = 40 N.



Work-Energy theorem

$$\Delta K = W_{net}$$

W = area under the curve between x = 1 m and x = 8 m.

$$W = 40\times 1 + \frac{1}{2}(40\times 2) - \frac{1}{2}(20\times 2) = 60\,J$$

$$W = \frac{1}{2}m(v_f^2 - v_i^2) = 2.5\,(v_f^2 - 8^2)$$

$$\frac{60}{2.5} = v_f^2 - 64 \Rightarrow v_f^2 = 88$$

$$v_f = \sqrt{88} = \boxed{9.38\ m/s}$$

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A 2.0 kg object moves along the x-axis, the only force acting on it is given by $\mathbf{F_x = -10\,x}$, where x is in meters.
The object has a speed of 4.0 m/s when it is at position x = 6.0m. Calculate the speed of the object when it is at position x = 2.0 m.

$$W = \int_6^2 F_x\, dx = \Delta K$$

$$-10\int_6^2 x\, dx = -10\,\frac{x^2}{2}\Big|_6^2$$

$$= +\frac{10}{2}\left(6^2 - 2^2\right) = +5\,(36-4)$$

$$= 160\ J$$

$$W = \Delta K = K_f - K_i = \frac{1}{2}m v_f^2 - \frac{1}{2}m(4)^2$$

$$160 = v_f^2 - 16$$

$$v_f^2 = 176 \qquad \boxed{v_f = 13.3\ m/s}$$